MIRA Light Engine
Instruction Manual

Emissions Certifications

This equipment has been tested and found to comply with the limits of EMC directive 2004/108/EC. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Safety Certifications

CB Scheme (IEC 61010-1:2010)
CE Declaration of Conformity
IEC 62471
TUV NRTL Listing (UL 61010-1:2012)
TUV Canadian Listing (CAN/CSA-C22.2 No. 61010-1:2012)
TUV European License (EN 61010-1:2010)

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lumencor

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1. Introduction

The Lumencor MIRA light engine is a compact solid-state light source for fluorescence microscopy and other bioanalytical applications. The MIRA light engine incorporates efficient thermal management, requiring no fan and providing quiet and vibration-free operation. This enables direct coupling to the fluorescence epi-illumination port of a microscope.

The light engine provides four distinct color bands of light output that are controlled using either manual control knobs on the side panel or the MIRA Control Tablet accessory. The “COLOR” knob located on the side panel is used for on/off control, selection of color channels and enabling external tablet control. The “INTENSITY” knob provides four different levels of output attenuation between 100% and 10% of maximum.

Model numbering for the MIRA light engine products are defined as follows: MIRA 4-XXX-FA. The XXX denotes 000-999 and/or AAA-ZZZ and defines the light engine recipe. F is any single alpha numeric and defines the light engine type while A is any alpha numeric which denotes the revision level.

2. Precautions and Warnings {Précautions et mises en garde}

A few simple practices will ensure trouble-free operation for the life of the light engine.

Les quelques règles simples suivantes permettront d’assurer un fonctionnement fiable pendant toute la durée de service de la source lumineuse.

Safety Instructions:
Please read and follow all safety instructions provided **BEFORE** using your new MIRA light engine. Failure to comply with the safety instructions may result in fire, electrical shock, or personal injury and may damage or impair protection provided by equipment. Please save all safety instructions.

Instructions de sécurité:
Veiller à lire et à respecter toutes les instructions de sécurité fournies **AVANT** d’utiliser le nouveau MIRA afin d’écarter les risques d’incendie, de décharge électrique, de blessure corporelle et de possibles dommages ou défaillance de la protection offerte par l’appareil. Conserver toutes les instructions de sécurité.

Safety Definitions {Définitions relatives à la sécurité}:

Warning: Statements identify conditions or practices that could result in personal injury.

Avertissement: déclarations qui identifient des situations ou des pratiques susceptibles d’entraîner des blessures corporelles.

Caution: Statements identify conditions or practices that could result in damage to your equipment.

Attention: déclarations qui identifient des situations ou des pratiques susceptibles d’endommager le matériel.

Safety Items {Mesures de sécurité}:

Warning: DO NOT use an unapproved power supply. The Lumencor-supplied external power supply is recommended for use with the MIRA light engine. Alternative 9 VDC power supplies may be used provided that the current is limited to 4.45 A max. Also, it is imperative that the alternative power supply has output over-current protection, as the power input of the MIRA is not fused. The equipment is required to be supplied by a DC power source that has been assessed to meet the requirements of a limited current circuit per clause 9.3 of IEC 61010-1. Connect the AC power cord to a receptacle with a protective safety (earth) ground terminal.

Avertissement : NE PAS utiliser une alimentation électrique non homologuée. Il est conseillé d'utiliser l'alimentation électrique externe fournie par Lumencor avec la source lumineuse MIRA. Il est possible d'utiliser une autre alimentation électrique continue 9 V à condition que l'intensité soit limitée à 4.45 A maximum. En outre, il est impératif qu'elle présente une protection de sortie contre les surintensités, car l'entrée d'alimentation du MIRA ne comporte pas de fusible. Le matériel doit être alimenté par une source d'alimentation continue qui a été déclarée conforme aux critères d'un circuit d'énergie limitée en vertu de la clause 9.3 de CEI 61010-1. Brancher le cordon électrique sur une prise de courant protégée par une borne de terre.

Warning: RISK GROUP 3 WARNING: UV emitted from this product. Avoid eye and skin exposure to unshielded product. Do not look at light engine output. Eye injury may result. The brightness of this light source is higher than most commercial lighting fixtures and is intended to couple directly into a microscope or other bioanalytical instrument.

Avertissement : GROUPE DE RISQUE 3 AVERTISSEMENT : UV émis à partir de ce produit. Éviter de regarder et l'exposition de la peau aux produits non blindée. Ne pas regarder le témoin de sortie du moteur. Risque de blessures aux yeux suite. La luminosité de cette source de lumière est plus élevé que la plupart des luminaires et est destiné à deux directement dans un microscope ou autre instrument bioanalytique.

RISK GROUP 3 WARNING:
UV emitted from this product. Possible hazardous optical radiation emitted from this product. Avoid eye and skin exposure to unshielded product. Do not look at light engine output. Eye injury may occur.
AVERTISSEMENT
RISQUE GROUPE 3:
UV émissions ; une possibilité de rayonnement optique dangereux. Éviter l'exposition non protégée de ce produit pour les yeux et la peau. Ne pas regarder directement la lumière de ce produit ; risque de blessure aux yeux.

Caution Label on MIRA Light Engine Package

Caution: DO NOT open the unit. There are no serviceable parts inside and opening the light engine enclosure will void the manufacturer's warranty. Changes or modifications not expressly approved by Lumencor void the user's authority to operate the equipment.

Attention: NE PAS ouvrir l'appareil. Il ne contient aucune pièce réparable et l'ouverture de son boîtier a pour effet d'annuler la garantie. Les changements ou modifications non approuvés expressément par Lumencor annuler l'autorité de l'utilisateur à faire fonctionner l'équipement.

Caution: DO NOT set liquids on the light engine. Spilled liquids may damage your light engine.

Attention: NE PAS placer de liquide sur la source lumineuse. Les liquides renversés peuvent endommager la source lumineuse.

Caution: DO NOT drop the light engine. It contains glass optical components that could be damaged or mis-aligned by the shock produced by a drop onto a hard surface.

Attention: NE PAS laisser tomber la source lumineuse. Elle contient des composants optiques en verre susceptibles d'être endommagés ou désalignés par le choc résultant d'une chute sur une surface dure.

DISCLAIMER: Lumencor shall not be liable for injury to the user or damage to the product resulting from the MIRA light engine being used in a way for which it was not intended and in complete disregard for all posted safety precautions and warnings.

AVIS DE NON-RESPONSABILITÉ: Lumencor décline toute responsabilité pour les blessures corporelles ou les dommages au produit résultant d'une utilisation du MIRA autre que celle prévue et du mépris total de toutes les mesures de sécurité et mises en garde affichées.

3. Operating Instructions

The MIRA light engine ships with the following list of standard components.

1. MIRA light engine configured with an output adapter for coupling to a specific microscope.
2. A 9 V / 4.45 A power supply (Lumencor part no. 27-10017).
3. A 6 ft AC power cord for the power supply (for North American customers, Lumencor part no. 29-10002, for UK customers, Lumencor part no. 29-10004 and for European customers, Lumencor part no. 29-10005).

3.1 Installation and Operation

When setting up the MIRA light engine, be sure that the adapter is securely attached to the appropriate illumination port of the microscope. Usually this will be the fluorescence epi-illumination port. Be careful to properly support the MIRA light engine until it is mechanically coupled to the instrument.

The MIRA light engine should be operated in an open area where airflow facilitates proper cooling. Restricting the airflow will cause the unit to operate at elevated temperatures and could result in decreased product life and/or premature failure.

The power supply should be plugged into the DC power connector at the back of the light engine. A green indicator light on the rear panel indicates that the light engine is powered on. A yellow indicator light below the “INTENSITY” control knob on the side panel alerts the user that light output is enabled.

Rear Panel of MIRA showing input receptacles for DC power supply, USB connection to touchscreen control tablet (“external”) and electronic shutter (“gate”)

Two control knobs are located on the side panel. The “COLOR” knob allows the user to turn on the light output for any of the four color channels. The selections are “V” for violet, “C” for cyan, “G” for green and “R” for the red color channel. The “W” setting is for white light, when all four color bands are simultaneously illuminated. The “ext”

setting allows the MIRA light engine to be controlled using the MIRA Control Tablet (see below). There are two “off” settings at opposite ends of the knob range. Both of these “off” settings turn the power completely off to the light engine.

Control Knobs Located on the Side Panel

Take necessary precautions to protect yourself and others from the high intensity light when turning on the unit. The MIRA light engine should be coupled to a microscope before it is turned on. The “INTENSITY” control knob sets four different levels of output attenuation between 100% and 10% of maximum. This setting is applied to the current source selection according to the position of the “COLOR” knob. It is recommended that the intensity be set to the “10%” position when a source is first turned on, and then increased as necessary. This protocol will help reduce the risk of damage to your eyes or a sample by gradually increasing the light output level. **BE AWARE** that although the human visual system does not register the wavelengths of light from the violet color channel, exposure can quickly produce eye damage.

3.2 Operation Using the MIRA Control Tablet

The MIRA light engine can be electronically controlled using the Control Tablet accessory (Lumencor part no. 83-10003). The MIRA light engine cannot be operated using a computer or third-party software. The external USB connector is designed for operation ONLY with the MIRA Control Tablet.

Charging the Tablet

Connect the tablet to a wall power outlet using the USB A (M) to micro USB (M) cable and DC charging adapter supplied with the tablet. Alternatively, remove the DC charging adapter and plug the USB A (M) connector into a computer USB port. The charge status of the tablet is indicated in the lower right-hand corner of the MIRA control app screen (see screenshot mage below)

MIRA Touchscreen control tablet (quick select screen)

Tablet-to-Light Engine Connection

Insert the micro USB (M) end of the micro USB (M) to USB A (F) OTG cable into the tablet. Connect the MIRA to the tablet using a USB A (M) to USB A (M) cable (p/n 29-10057) by inserting one end in the USB port marked external on the MIRA light engine and the other end in the USB A (F) receptacle of the OTG cable. Connect the MIRA DC power supply and turn the COLOR control knob on the side panel of the MIRA from off to **ext**. Next, turn the tablet on and select the MIRA app from the Lumencor Light Engine Application Launcher. Successful connection is indicated by opening of the Quick Select screen (see above) and the display of a "Light Engine Active" message onscreen for a few seconds. If a connection is not obtained, go to the Setup screen by pressing the selector button at the top of the screen and press the RECONNECT button. The MIRA control app has 3 control screens, selected by navigation buttons across the top of the screen and described in the tablet operations table below.

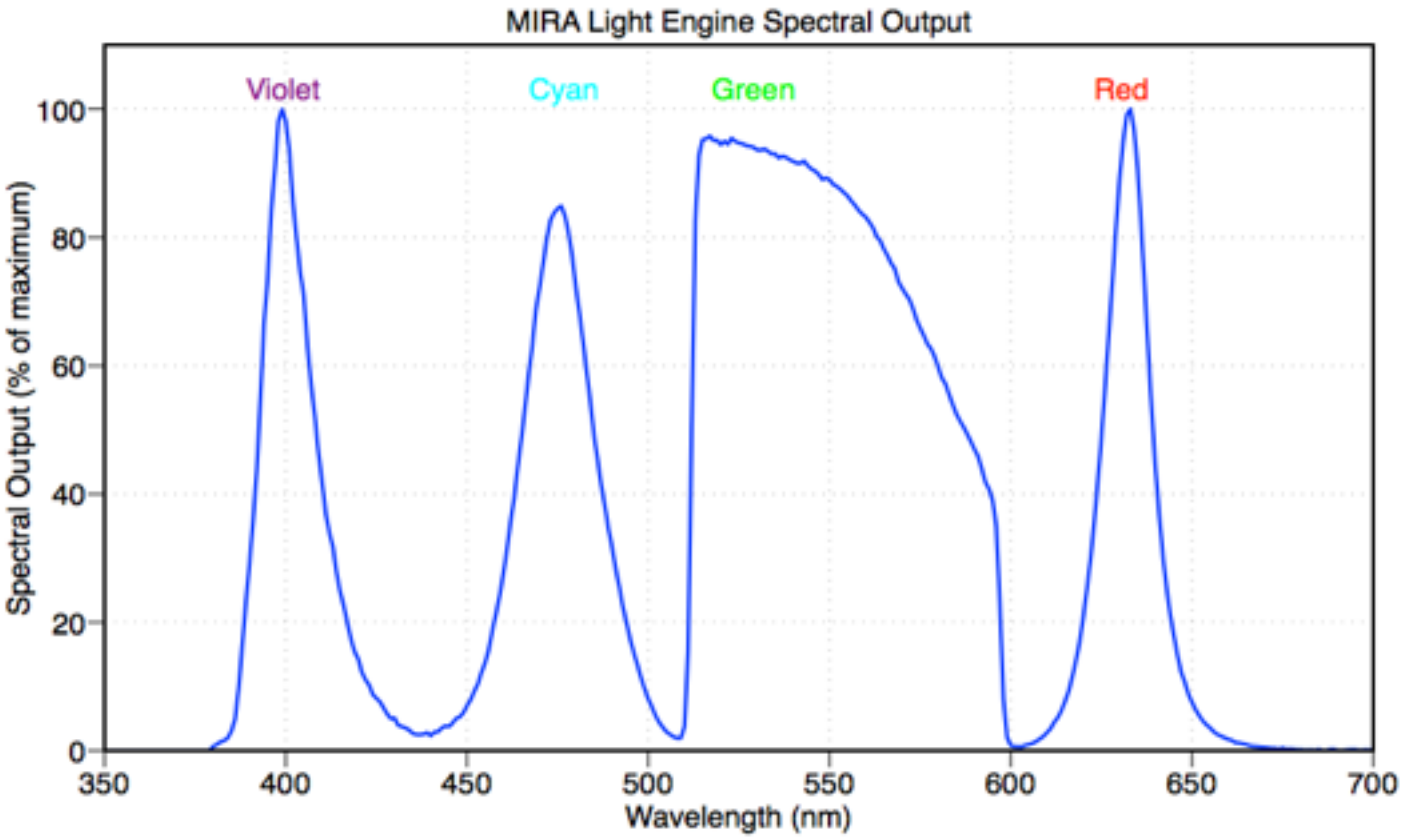
MIRA TABLET OPERATIONS	
CONTROL	**OPERATION**
Quick Select Screen	
COLOR	Consecutive presses of the COLOR button sequentially select the red, green, cyan, violet and white (red+green+cyan+violet) sources.
% INTENSITY	Consecutive presses of the % INTENSITY button sequentially adjust the output power of the selected color source to 100%, 50%, 25% and 10% of maximum.
ON/OFF	Consecutive presses of the ON/OFF button turn the source selected by the COLOR button on and off [1].
SCREEN	Consecutive presses of the SCREEN button change the screen background from white to gray and back [2].
Single Select Screen	
OUTPUT	One-touch selection of red, green, cyan, violet and white (red+green +cyan+violet) sources.
% INTENSITY	One-touch selection of 100%, 50%, 25%, 10% or 0% of maximum intensity for the source selected by the OUTPUT button.
Setup Screen	
RECONNECT	Press RECONNECT if serial communication with the MIRA is lost, or is not established by the initial connection process.
LE AUTO SHUTDOWN	User may select a time interval from a drop-down list after which the light engine output will be shut off without further user intervention.
TIME UNTIL DISPLAY DiIMS	User may select a time interval from a drop-down list after which the tablet display will be dimmed to conserve battery power.
NOTES [1] Any light sources that are ON when the app is exited will automatically be shut off. [2] The gray screen background is useful in cases when subdued ambient lighting is required and also conserves battery power.	

3.3 Using the Gate Connector

The MIRA light engine output can be turned on/off electronically using the electronic shutter function accessed through the BNC “gate” connector located on the rear panel. A > 3.3 V “high” signal applied to the BNC connector will turn the source on while a <1.5 V signal turns the source off. The MIRA light engine can support an on/off switching rate up to approximately 100 Hz. Note that DC control levels applied to the gate connector DO NOT trigger selected color channels. Light sources must first be enabled using the side panel COLOR control knob or the touchscreen control tablet. Switching the gate connector to ground will then shut off light output. Restoring the input level to >3.3 V will restart light output.

4. Spectral Output

The normalized spectrum shown below is representative of the MIRA light engine output. External bandpass filters can be used to restrict the wavelength range of each color channel.



5. Product Specifications

The MIRA light engine must be operated and stored within the environmental conditions specified.

Specification	Detail
Temperature	
Operating	32 to 95° F (0 to 35° C)
Non-operating	-4 to 158° F (-20 to 70° C)
Humidity	
Operating and non-operating	0 to 80% relative humidity, non-condensing
Altitude	
Operating	0 to 10,000 feet (3,048 meters)
Non-operating	0 to 20,000 feet (6,096 meters)
Dimensions (WxLxH)	3.5 in x 6.0 in x 4.0 in / 9 cm x 15 cm x 10 cm
Weight	3.3 lb / 1.5 kg
Lifetime	> 20,000 hr
Input Power Requirements	24 VDC / 1.7 A, 40 W maximum, power supply included
Switching Speed	On/Off rate up to 100 Hz
Warm-up Period	1 s
Protection	IP Rating of X0
Sound Level	Sound Level at 1 m = 0 db(A)
Connections	USB A for MIRA Control Tablet and one BNC connection for TTL gating
Warranty	12 months parts and labor for end users

6. Routine Maintenance and Troubleshooting

Remove any built-up dust or accumulation on the vent holes. A vacuum may be used to remove debris so that a steady supply of air is available for cooling. It is recommended that the vent holes be cleaned by a gentle suction device at least every 6 months and more often in dusty or smoke-filled environments.

There are no user-replaceable components or sub-assemblies in MIRA light engines. Opening the light engine enclosure will void the manufacturer's warranty.

7. Customer Support

For technical support of the MIRA light engine, please contact Lumencor by phone at 503.213.4269 or through e-mail at techsupport@lumencor.com. Any light engine return to Lumencor for repair or refurbishment requires a return material authorization (RMA) number. To request an RMA number, submit the online request form at http://lumencor.com/support/lumencor-rma-request-form/. Units that are returned to Lumencor without an RMA number will not be accepted. Notification of RMA issuance, together with shipping instructions will be sent to the customer e-mail address provided on the request form. It is the customer's responsibility to properly package and safely ship products to Lumencor. The customer is responsible for selecting the method of shipment to Lumencor and paying for the shipment. If it is determined that necessary repairs or refurbishment are covered by warranty, then Lumencor will pay for return shipment to the customer. For out-of-warranty service work, Lumencor will evaluate the light engine upon receipt and then provide a quotation for the cost of necessary repairs or refurbishment. Work will not begin until a purchase order for the quoted services has been received.

8. Warranty

The MIRA light engine comes with a 12 month warranty starting from the date of shipment from Lumencor's factory in Beaverton, OR.

9. Declaration of Conformance

The presence of the CE Mark on a product means that this instrument has been designed, tested and certified compliant to all applicable European Union (CE) regulations and recommendations.

Manufacturer: Lumencor, Inc.
14964 NW Greenbrier Parkway
Beaverton, OR 97006
United States of America

Product Name: MIRA light engine
Model Numbers: MIRA 4-XXX-FA
Year mark affixed: 2014
Type of Equipment: Photo-optical apparatus for illumination in research, clinical and laboratory use.

We declare under our sole responsibility that the MIRA light engine, identified with the CE mark, conforms to the following directives and regulations:

CB Scheme (IEC 61010-1:2010)
CE Declaration of Conformity
EMC Directive 2004/108/EC
Low Voltage Directive 2006/95/EC
IEC/EN 62471:2008, Photobiological Safety of Lamps and Lamp Systems Certification
RoHS Directive 2002/95/EC
REACH (Registration, Evaluation, Authorization of Chemicals Regulation) Directive 1907/2006
TÜV SÜD America, NRTL Listing (UL 61010-1:2012)
TÜV SÜD America, Canadian Listing (CAN/CSA-C22.2 No. 61010-1:2012)
TÜV SÜD America, European License (EN 61010-1:2010)

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